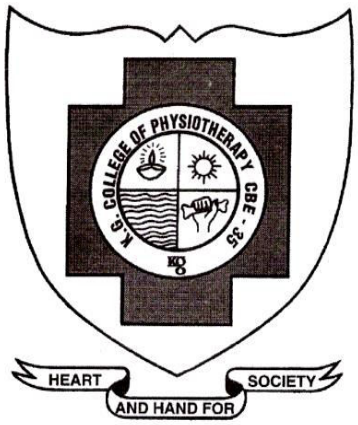
"THE EFFECT OF TRUNK REHABILITATION EXERCISES VERSUS TASK ORIENTED TRAINING ON TRUNK CONTROL ABILITY, BALANCE AND FUNCTIONAL MOBILITY IN PATIENTS WITH STROKE"



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ELECTIVE: PHYSIOTHERAPY IN NEUROLOGY

A DISSERTATION SUBMITTED TO THE TAMILNADU

Dr. M.G.R. MEDICAL UNIVERSITY, CHENNAI,

AS PARTIAL FULFILLMENT OF THE

MASTER OF PHYSIOTHERAPY DEGREE

MAY 2018

CERTIFICATE

This is to certify that a bonafide work of **Mr. A. Fernandez Franklin** of K.G.College of Physiotherapy, Coimbatore submitted in partial fulfillment for the requirements of Master of Physiotherapy Degree course from the Tamil Nadu Dr. M. G. R Medical University under the **Registration No: 271620302** for the May 2018 Examination.

Place: Coimbatore Principal

Date:

"THE EFFECT OF TRUNK REHABILITATION EXERCISES VERSUS TASK ORIENTED TRAINING ON TRUNK CONTROL ABILITY, BALANCE AND FUNCTIONAL MOBILITY IN PATIENTS WITH STROKE"

Under the guidance of,

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Internal examiner

External examiner

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INTRODUCTION

Vascular disease of nervous system are the most frequent cause of admission to the hospital. Stroke is one of the major causes of morbidity and death. It is the acute manifestation of cardiovascular disease.Stroke is defined as rapidly developing clinical signs of focus (or global) disturbance of cerebral function, lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin **(WHO 2005).**

Stroke also become the third component cause of death in India, especially from the vascular origin the prevalence of stroke about 200 per 100,000 person **(Neuro India, 2002).** There is estimated 30 incidence of stroke per 60 seconds World Wide. Majority are referred to as "silent" strokes. Approximately 110,00 people have stroke each year in UK with over 900,000 alive survived a stroke.

Different mechanisms have been found to cause vascular insufficiency to the brain resulting in stroke. However, the most common cause are thrombus, emboli, and hemorrhage. There are some risk factors that can predispose stroke. The common ones are diabetes, high blood pressure and cardiac disorders. Other secondary risk factors are cigarette smoking, obesity, sedentary life style, increased consumption of high fat diet, psychological stress and excessive alcohol intake. **(Samuel Raja, 2006)**

Medical management of stroke include anticoagulants, osmotic agents and potent steroids, vasodilators. Surgical management includes carotid Endarectomy, Thromboectomy, Hemicraniectomy.

In addition to weakness of limbs stroke patients also will represent trunk impairments which often results in poor, balance and frequent falls. It has been identified that stroke patients have abnormal and delayed postural responses in the lower extremity muscles in standing. Other postural control problems after stroke are loss of anticipatory activation of trunk muscles during voluntary movements, an increase in sway during quit standing, a decreased area of stability in stance, delayed and disrupted equilibrium reactions, and reduced weight bearing on the paretic limb and increased risk of falling.

Balance is a complex task involving the detection and integration of sensory information to assess the movement and position of the body in space and the execution of specific musculoskeletal responses to control body position within the context of the environment and task .Balance impairment in patients with stroke is frequently related to deficits of central integration of afferent inputs (somatosensory, visual, vestibular).The two immediate impairments of most significance to gait performance are diminished strength, or the inability to generate voluntary muscle contractions of normal magnitude in any muscle groups, and inappropriately timed or inappropriately graded muscle activity.

The performance of gait is directed to the accomplishment of four related tasks: maintaining the balance of the heavy trunk, arms and head on two ball and socket joints; maintaining support of the limb segments during stance phase; clearing the floor with the swinging foot during swing phase; supplying enough energy to the body system with each stride to cause it to move forward, and, preferably, accomplishing this using energy conservation measures. The accomplishment of these seemingly simple tasks may present substantial challenges to an impaired movement system.

Most literature concerning rehabilitation after stroke focuses on the hemiplegic upper and lower limbs while the trunk receives little attention. Poor recovery of trunk muscle performance results in a severe disability and a reduction in the activities of daily living. In stroke rehabilitation, trunk muscle performance is an important factor in predicting the functional outcome. (Fujiwara T et al 2001). Trunk movements in person with stroke are executed by upper trunk with very minimal anterior tilt of the pelvis i.e. mobility over stability skill is impaired. Therefore, selective trunk muscle exercises are indeed related to clinical practice in patients with stroke.

Task-oriented training, the practice of goal-directed, functional movement is carried out in a natural environment. Task-oriented training involves a variety of

practices to help patients derive optimal control strategies for solving motor problems. During task-oriented training, many types of movement are practiced, to limit compensatory movements and increase adaptive movements are increased. (Carr JH, et al 2003).Task-oriented training is a method which focuses on specific functional tasks associated with the musculoskeletal and neuromuscular systems. In task oriented training, gait and gait-related tasks are practiced using a functional approach. (Yang YR et al 2006).

The present study compared the effects of trunk rehabilitation versus task-oriented training on the trunk control ability, balance and functional mobility of stroke patients to suggest effective training methods for the functional improvement of stroke patients.

1.1 NEED FOR THE STUDY

Stroke is most common debilitating disorder which affects middle and elderly individuals. A most common component of post stroke disability is poor trunk control, impaired balance and reduced functional mobility. Most of the rehabilitation protocols focus only on the paretic upper and lower limbs were the trunk receives less attention. Although many treatment strategies have evolved over the years for the rehabilitation the effectiveness of many of these techniques is yet to be validated. Based on previous studies, Trunk rehabilitation exercises and task oriented training have demonstrated significant improvement of in recovery of trunk function. So this study aims to compare the effect of Trunk rehabilitation exercises and task oriented training on trunk control ability, balance and functional mobility in stroke patients.

1.2 STATEMENT OF THE PROBLEM:

To compare the effect of Trunk rehabilitation exercises and Task oriented training on trunk control ability, balance and functional mobility in patients with stroke.

1.3 KEYWORDS

- Stroke
- Trunk rehabilitation exercises

- Task oriented training
- Berg balance scale
- Trunk impairment scale
- Timed up and go test

1.4 OBJECTIVES OF THE STUDY

- To study the effect of Trunk rehabilitation exercises on trunk control ability, balance and functional mobility in patients with stroke.
- To study the effect of Task oriented training on trunk control ability, balance and functional mobility in patients with stroke.
- To compare the effect of Trunk rehabilitation exercises and Task oriented Training on trunk control ability, balance and functional mobility in patients with stroke.

1.5 HYPOTHESES

1.5.1 NULL HYPOTHESIS

- There is no significant difference between the effect of Trunk rehabilitation exercises and Task oriented Training on trunk control ability, balance and functional mobility in patients with stroke.

1.5.2 ALTERNATE HYPOTHESIS

- There is significant difference between the effect of Trunk rehabilitation exercises and Task oriented Training on trunk control ability, balance and functional mobility in patients with stroke.

REVIEW OF LITERATURE

REVIEW ON STROKE REHABILITATION

- **Miller KJ et al., 2003**

Studied on twenty seven volunteers (age 64.2+ or -20.0 years) undergoing 4 weeks of rehabilitation after stroke was participated in the study. Three functional measures (Berg Balance Scale, Clinical Outcome Variable Scale, Gait Speed) were assessed. After a month of rehabilitation, there was an improvement in all outcome measures (functional, physiologic).

- **RPS Van Peppen et al.,2004**

The researchers said the evidence of physical therapy interventions aimed on improving functional outcome after stroke. In total 123 randomized controlled studies and 28 controlled trials were included in the study. Based on the high quality RCT's strong evidence was found in the favor of task oriented exercise training to restore balance and gait, and for strengthening, the lower paretic limb, in particular when applies intensively and early after stroke onset.

- **Jung-Hee Kim et al.,2013**

In this study that core strengthening has been rediscovered in rehabilitation of stroke patients. He described the muscular control required

around the lumbar spine for maintenance of functional stability. The core muscles serves as a muscular core set that act as a unit to stabilize the body and the spine, with and without the limb movement. He included 16 stroke patients who were randomly divided into two groups. The result of the study suggest the feasibility and suitability of core or trunk rehabilitation exercises on stroke patients.

REVIEWS ON TASK ORIENTED EXERCISES FOR TRUNK IN STROKE

- **Dean cm et al., 2000**

  This study provide evidence for the efficacy of task related circuit class at improving loco motor function in chronic stroke. A total 12 subjects were included in this study and the lower limb function was evaluated by measuring walking speed and endurance, peak vertical ground reaction force through the affected foot during sit to stand, and the step test.

- **Jang sh et al., 2003**

  His study concluded that cortical reorganization was induced by the task oriented training program in chronic hemi paretic subjects. A total of 4 chronic patients were included in the study. The functional status of the affected hand and Functional MRI were assessed before and after the TT

program. Fmri was performed at 1.5 T in parallel with timed finger flexion extension exercises at fixed rate.

- **Mayo NE et al., 2004**

  This study evaluated the efficacy of task oriented intervention in enhancing competence in walking in people with stroke. Total of ninety-one subjects a residual walking deficit with one year of a first or recurrent stroke consented to participate the study duration was 6 months, the exercise interventions comprised 10 functional tasks that designed to strengthen the lower extremities and enhance walking balance, speed and distance. The result was measured using BBS, 6m walk test . the study finding reported that efficacy of task oriented interventions in enhancing walking distance and speed in the first year post stroke.

- **Salbach NM et al., 2005**

  Evaluated the efficacy of task oriented walking interventions in improving balance self efficacy in patients with stroke. Total of ninetyone patients were included in the study and the outcome was measured using BBS, 6m walk test, 5 m walk test and timed up and go test, and concluded that the walking intervention was associated with a significantly greater average propotional change in balance self efficacy than UE interventions.

- **Bayouk J.F et al.,2006**

This study compared the effects of task oriented exercises program with and without altered sensory input on postural stability in subjects with stroke.

REVIEWS ON TRUNK STABILITY IN STROKE

- **S.Karthickbabu et al .,2011**

Studied the sensory motor improvement interferes with functional performance after stroke. His electromyography analysis observed that the anticipatory postural adjustment of trunk muscles is impaired in patients with stroke. Hence the trunk control is prerequisite for the distal limb movement control, balance, weight symmetry and functional activities in patients with stroke.

- **Kim TJ et al ., 2015**

Their recent study confirmed that the relationship between trunk performances and functional outcomes in patients with stroke, according to gait ability and is of predictive value in terms of functional prognosis in patients with stroke. The subjects were divided into two groups according to gait ability at early stage of stroke. Concluded that the strong relationship between trunk performance and functional outcome in patients with stroke emphazises the importance of trunk rehabilitation.

REVIEWS ON TRUNK REHABILITATION IN STROKE

- **Testuya Tsuji et al., 2003**

  Analyzed side difference in bilateral trunk muscles in patients with hemi paretic stroke, to relate it with impairment and disability variables. Indicated the importance of the assessing the trunk function in order to predict patients functional status. His sample consists of 131 consecutive patients with recent on set, first time hemi paretic stroke. Concluded longitudinally, the CSA and CT numbers increased bilaterally with a conventional stroke rehabilitation program.

- **Feigin et al., 2010.**

His study stated that trunk stabilization in stroke patients is an important prognosticator of the recovery of balance ability and functional ambulation. His study aimed to determine the effects of trunk stabilization exercises on the balance abilities of the stroke patients. He concluded that trunk stabilization exercises enhances the trunk stability and postural control by stimulating proprioceptive receptors through sensory-motor coordination training to maintain the standing position. These exercises are overcoming the drawbacks of conventional physiotherapy exercise program.

- **Fernanda m caballero et al., 2015**

Recently studied the additional trunk stability exercises on improving dynamic sitting balance and trunk control for sub acute patients. eighty subjects were divided randomly. Both underwent trunk stabilization exercises on different surfaces. The result shows statistically significant differences for all of the total score in experimental group.

- **Tobias Braun et al., 2015**

Evaluated the feasibility and preliminary effectiveness of additional dynamic and static passive standing performed by patients with sub acute stroke supervised by physiotherapist. A total of 116 patients were included in the study and the effectiveness was measured by BBS. They concluded that in severely affected individual with stroke, dynamic standing on unstable surface can be performed safely by trained helpers.

REVIEW ON BALANCE AND GAIT IN STROKE PATIENTS

- **SUSAN O SULLIVAN 1986**

Balance is disturbed following stroke with impairment in steadiness, symmetry, and dynamic stability is common. Demonstrates asymmetry with most of the weight in sitting and standing shifted toward a stronger side, and postural sway in standing. Delay in the onset of motor activity, abnormal

timing and sequence of muscle activity, and abnormal co-contractions results in disorganization of postural synergies.

REVIEWS ON BERG BALANCE SCALE

- **Korner-bitensky et al.,2008**

In a recent study 655 physiotherapist working with stroke population, identified that BERG BALANCE Scale is the most commonly used assessment tool across the continuum of stroke rehabilitation. The purpose of the study was to review the psychometric properties of BBS specific to stroke and to identify strengths and weakness in its usefulness of stroke rehabilitation. Twenty one studies examined the psychometric properties of BBS and 16 studies examined on validity of BBS with stroke population were retrieved. Stated that BBS is a psychometrically sound measure of balance impairment using post stroke assessment.

- **Tyson SF and Connell LA 2009**

Studied and identified that clinically feasible measurement tools of balance ability in subjects with neurological conditions to be recommended. 19 measurement tools were selected. Of these Brunel balance assessment and Berg Balance scale in sitting and standing,weight shift, step/tap and step –up tests reached the required standard and are usable in clinical practice.

- **Down S and Marques 2013**

Studied that berg balance scale has high intra and inter rater reliability in measuring balance ability in patients from suffering from balance impairment. 11 studies involving 668 subjects were included in the review. The intra reliability was with a pooled estimate of 0.98 and inter reliability of 0.97. They concluded that Berg Balance Scale has absolute reliability among people with moderately poor to normal balance.

- **Kuan-lin Chen et .,2014**

Studied about the responsiveness of the original and the short from Berg Balance scale in subjects with stroke at both the individual level and group level. Total of 226,202, and 168 subjects with stroke were assessed with berg balance scale and SFBBS data were extracted from the patient's response on the BBS. At the individual person level, the berg balance scale detected significant improvement in balance about twice as many patients as the SFBBS detected.

REVIEWS ON TRUNK IMPAIRMENT SCALE

- **G.Verheyden et al., 2004**

The aim of the study was to develop a measurement tool to evaluate the impairment of the trunk. The trunk impairment scale (TIS) is a new tool

to measure motor impairment of trunk after stroke. TIS evaluate static and dynamic sitting balance as well as co ordination of the trunk movement.

- **Marta sideway et al.,2014**

  Stated that trunk impairment scale is the only well validated tool to examine a patient with hemi paresis taking into account qualitative and quantitative assessment of the trunk deficit.

- **Alice niewboer et al.,2005**

  Done a study to determine the discriminate ability of the trunk impairment scale by comparing the stroke patients with healthy individual and concluded that the TIS discriminates between stroke patients and healthy subjects.

REVIEWS ON TIMED UP AND GO TEST

- **Shamay S et al., (2005)**

  Timed up and go test showed excellent reliability and were able to differentiate the patients from the healthy elderly subjects and correlated well with plantar flexor strength, gait performance and walking endurance in subjects with chronic stroke.

MATERIALS AND METHODOLOGY

3.1. MATERIALS REQUIRED

- Steps
- Balance beams
- Balls
- Treadmill

3.2. STUDY DESIGN

Two group pre-test and post-test experimental study design.

3.3. STUDY SETTING

The study was conducted in physiotherapy outpatient department, K.G Hospital, Coimbatore.

3.4. STUDY SAMPLING

Based on the selection criteria, 30 ischemic stroke subjects were selected and they were allotted into 2 groups by simple random sampling method with 15 subjects in each group.

3.5. STUDY DURATION

The study was conducted for a period of six months.

3.6. CRITERIA FOR SELECTION

Inclusion criteria

- Both sexes were included in the study.
- Age between 45 to 65 years
- Subjects with no medical contraindications against trunk exercise.
- Subjects with no disease affecting the balance.
- No history of surgery due to musculoskeletal diseases.
- Subjects who were independently able to sit and stand for more than 30 seconds
- Subjects with ability to understand therapist direction and communication.
- Subjects with moderate stroke according to Orphington's Prognostic scale.

Exclusion criteria

- Subjects with loss of sensation
- Subjects with cognitive impairments.
- Traumatic brain injury

- Uncontrolled diabetes mellitus, hypertension and postural hypotension.
- Subjects with musculoskeletal problems subjects with psychiatric illness.
- Subjects with hypersensitivity
- Subjects who depend on any orthotic devices
- Brain tumors
- History of diseases with vertigo and vestibular dysfunctions.
- Visual and impairments and hearing deficits.

3.7. VARIABLES

INDEPENDENT VARIABLE

- Trunk rehabilitation exercises
- Task oriented exercises

DEPENDENT VARIABLE

- Trunk control ability
- Balance
- Functional mobility

3.8. OUTCOME MEASURES

- Trunk impairment scale

- Berg balance scale
- Timed up and go test

3.9. PARAMETERS

- Trunk control ability
- Balance
- Gait

3.10. ORIENTATTION OF THE SUBJECTS

Before treatment, all subjects were explained about the study and the procedure to be applied and were asked to inform if they felt any discomfort during the course of treatment. All subjects who were interested to participate in the study were asked to sign the consent form before the study.

3.11. PROCEDURE

Based on the selection criteria 30 stroke subjects were selected. They were assigned to two groups by simple random sampling method, with 15 subjects in each group. All 30 subjects were involved for pre test assessment for trunk control ability, balance and functional mobility.

The 12 weeks treatment program was given 5 days per week, 60 minutes per session.

GROUP A (EXPERIMENTAL GROUP)

- Warm up exercises for 5 minutes
- Task oriented exercises consists of walking-related tasks which were designed to strengthen the lower extremities as well as trunk and functional training.

The following exercises were done.

- Step ups
- Balance beams
- Kicking a ball
- Stand up and walk
- Obstacle cross
- Treadmill
- Walk and carry
- Speed walk
- Walk backwards
- Stairs

Functional training exercises such as trunk rotation towards right and left, forward reach, picking up from the floor etc.

- Total duration of exercises is 50 minutes.
- Cool down exercises for 5 minutes

GROUP B (CONTROL GROUP)

- Warm up exercises for 5 minutes
- Trunk rehabilitation exercises were given on stable surface (plinth) and functional training exercises for 50 minutes.

The following exercises were done in the plinth for the trunk.

- Pelvic Bridging
- Single leg bridging
- Bridging with SLR
- Pelvic floor contraction
- Knee rolling
- Single leg drop-outs
- Side laying clams
- Four point kneeling
- Bridging with arms above head

- Bilateral leg cycling
- Superman pose

- Cool down exercises for 5 minutes

The 12 weeks treatment program was given 5 days per week, 60 minutes per session.

After 12 weeks of treatment, all subjects from 2 groups were involved for the post test assessment.

3.11 STATISTICAL TOOL USED

Paired "t" test.

Formula: Paired "t"-test

$$S = \sqrt{\frac{\sum d^2 - [\sum d]^2}{n-1}}$$

$$t = \frac{\overline{d\sqrt{n}}}{s}$$

d = Difference between the pre-test Vs post-test

$\overline{d}$ = Mean difference

n = Number of subjects

s = Standard deviation

Unpaired "t" test

Formula:

$$S = \sqrt{\frac{\sum (x_1 - \bar{x}_1)^2 + \sum (x_2 - \bar{x}_2)^2}{n1 + n2 - 2}}$$

$$t = \frac{\bar{x}_1 - \bar{x}_2}{s} \sqrt{\frac{n_1 n_2}{n_1 + n_2}}$$

n_1 = Total number of subjects in Group A

n_2 = Total number of subjects in Group B

x_1 = Difference between pre-test Vs post-test of Group A

$\bar{x}_1$ = Mean difference between pre-test Vs post-test of Group A

x_2 = Difference between pre-test Vs post-test of Group B

$\bar{x}_2$ = Mean difference between pre-test Vs post-test of Group B

IV.DATA ANALYSIS AND INTERPRETATION

TABLE-I

PAIRED 't' TEST- TRUNK IMPAIRMENT SCALE

PRETEST AND POST TEST VALUES OF GROUP A

S. NO	GROUP A	MEAN	STANDARD DEVIATION	MEAN DIFFERENCE	't' VALUE
1	Pre-Test	14.27	±1.83	4.06	8.100
2	Post-Test	18.33	±1.11		

Using paired 't' test with 14 degrees of freedom and 0.05% as a level of significance, the table 't' value is 2.145 which was lesser than the calculated 't' value 8.100. The result shows that there was marked difference between pre-test and post-test values.

GRAPH-I

PAIRED ‘t’ TEST- TRUNK IMPAIRMENT SCALE

GRAPHICAL REPRESENTATION OF PRETEST AND POST TEST VALUES OF GROUP A

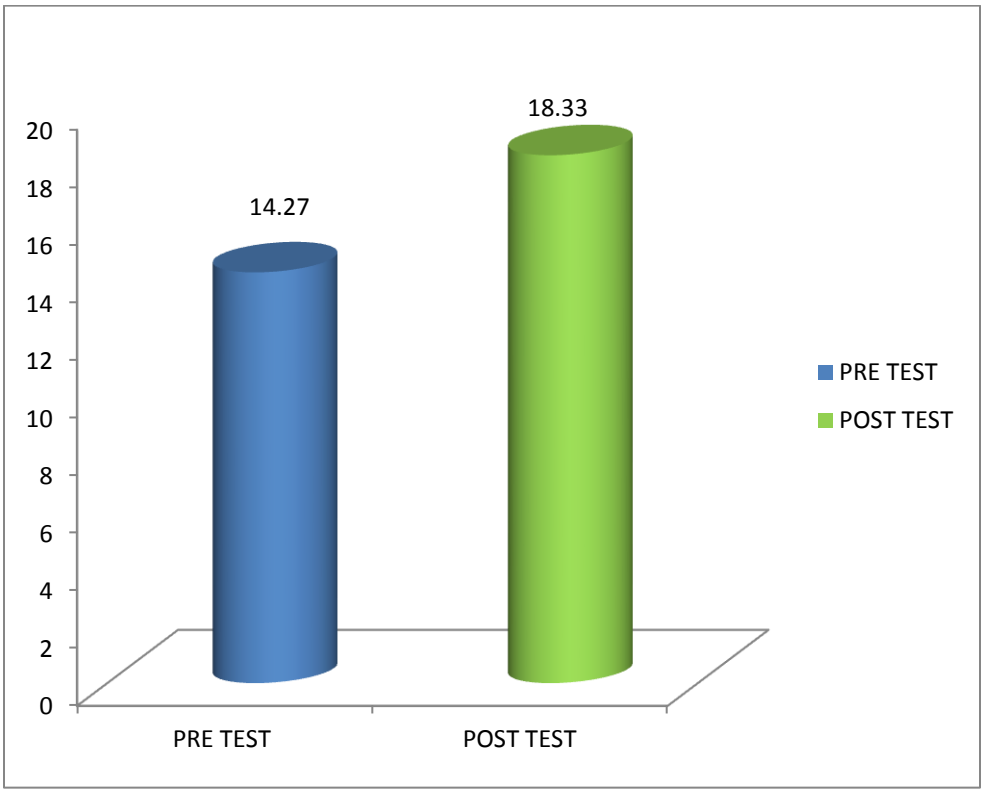


TABLE-II

PAIRED ‘t’ TEST- TRUNK IMPAIRMENT SCALE

PRETEST AND POST TEST VALUES OF GROUP B

S.NO	GROUP B	MEAN	STANDARD DEVIATION	MEAN DIFFERENCE	‘t’ VALUE
1	Pre-Test	14.25	±2.02	1.6	2.6321
2	Post-Test	15.87	±1.46		

Using paired ‘t’ test with 14 degrees of freedom and 0.05% as a level of significance, the table ‘t’ value is 2.145 which was lesser than the calculated ‘t’ value 2.6321. The result shows that there was marked difference between pre-test and post-test values.

GRAPH-II

PAIRED ‘t’ TEST- TRUNK IMPAIRMENT SCALE

GRAPHICAL REPRESENTATION OF PRETEST AND POST TEST VALUES OF GROUP B

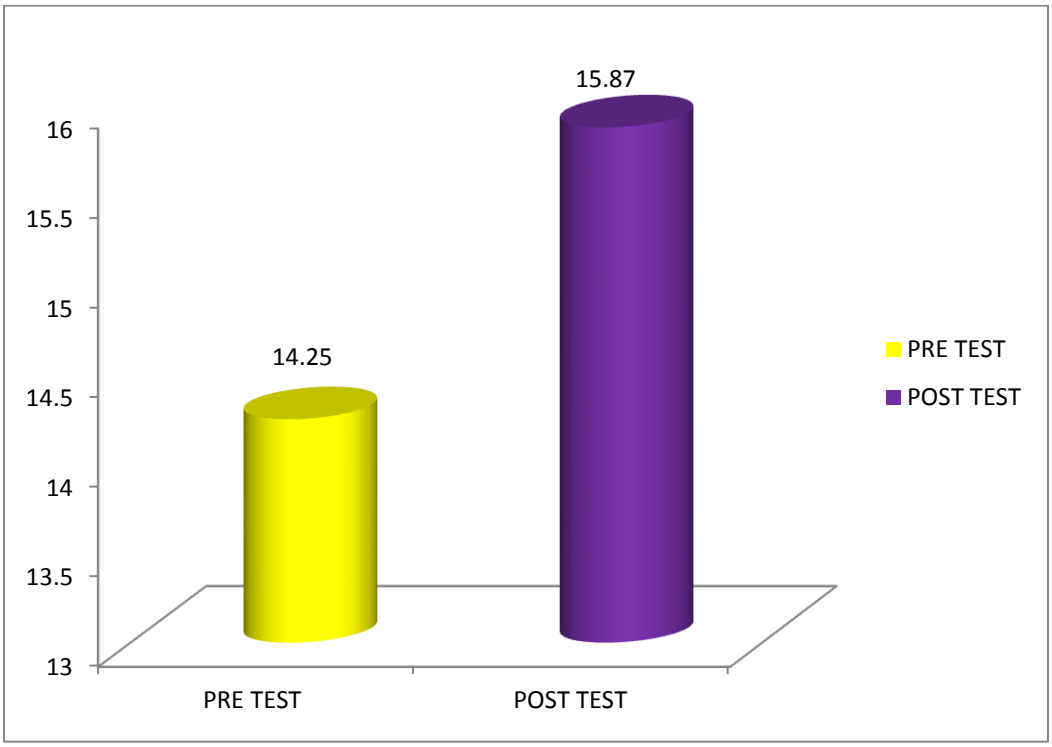


TABLE III

UNPAIRED 't' TEST OF

TRUNK IMPAIRMENT SCALE POST TEST VALUES OF GROUP A AND GROUP B

S.NO	GROUPS	MEAN	STANDARD DEVIATION	MEAN DIFFERENCE	't' VALUE
1.	Group A	18.33	±1.11	2.46	5.2103
2.	Group B	15.87	±1.46		

Using unpaired 't' test with 28 degrees of freedom at 0.05 % level of significance, the calculated post test 't' value of group A and group B was 5.2103 which is greater than the critical value 2.048 which states that there is significant difference between the post test values of group A and group B

GRAPH III

UNPAIRED ‘t’ TEST OF

TRUNK IMPAIRMENT SCALE

GRAPHICAL REPRESENTATION OF

POST TEST VALUES OF GROUP A AND GROUP B

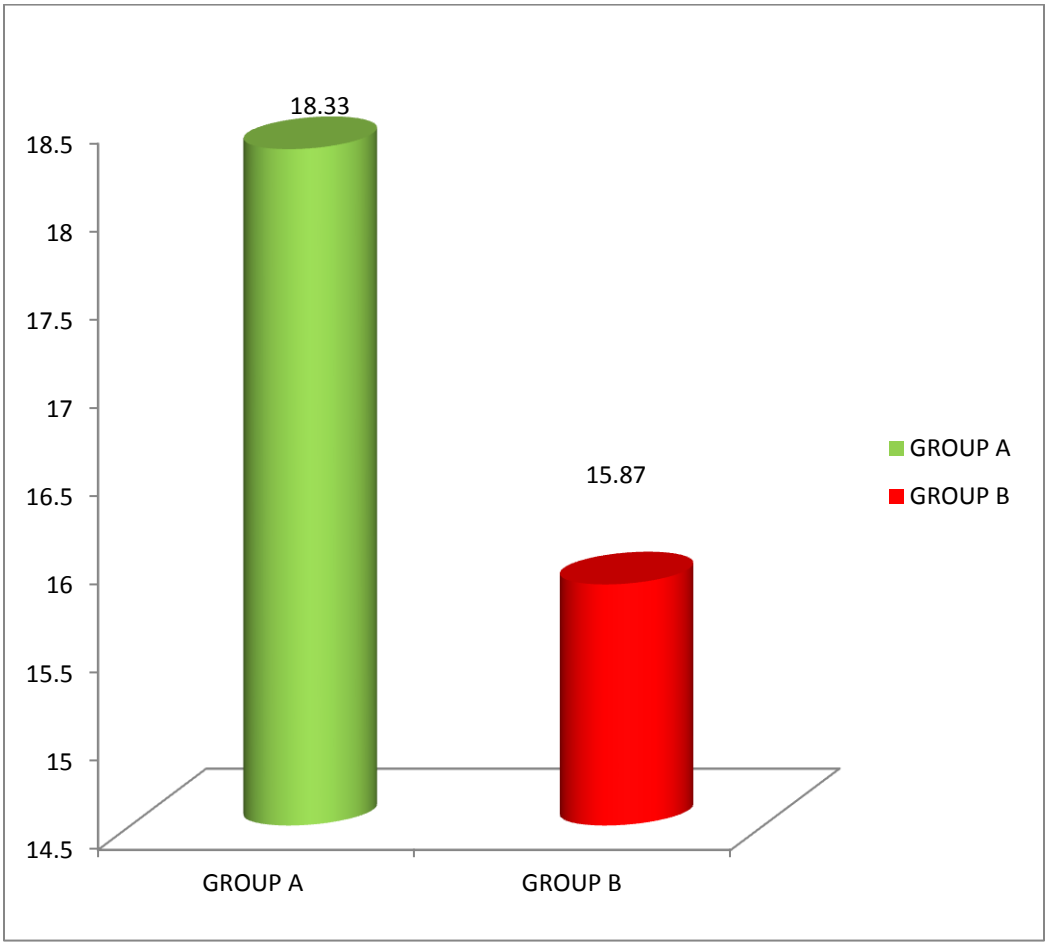


TABLE-IV

PAIRED 't' TEST- BERG BALANCE SCALE

PRETEST AND POST TEST VALUES OF GROUP A

S.NO	GROUP A	MEAN	STANDARD DEVIATION	MEAN DIFFERENCE	't' VALUE
1.	PRE TEST	26.47	±1.46	19.46	51.734
2.	POST TEST	45.93	±1.58		

Using paired 't' test with 14 degrees of freedom and 0.05% as a level of significance, the table 't' value is 2.145 which was lesser than the calculated 't' value 51.734. The result shows that there was marked difference between pre-test and post-test values

GRAPH-IV

PAIRED ‘t’ TEST- BERG BALANCE SCALE

GRAPHICAL REPRESENTATION OF PRETEST AND POST TEST VALUES OF GROUP A

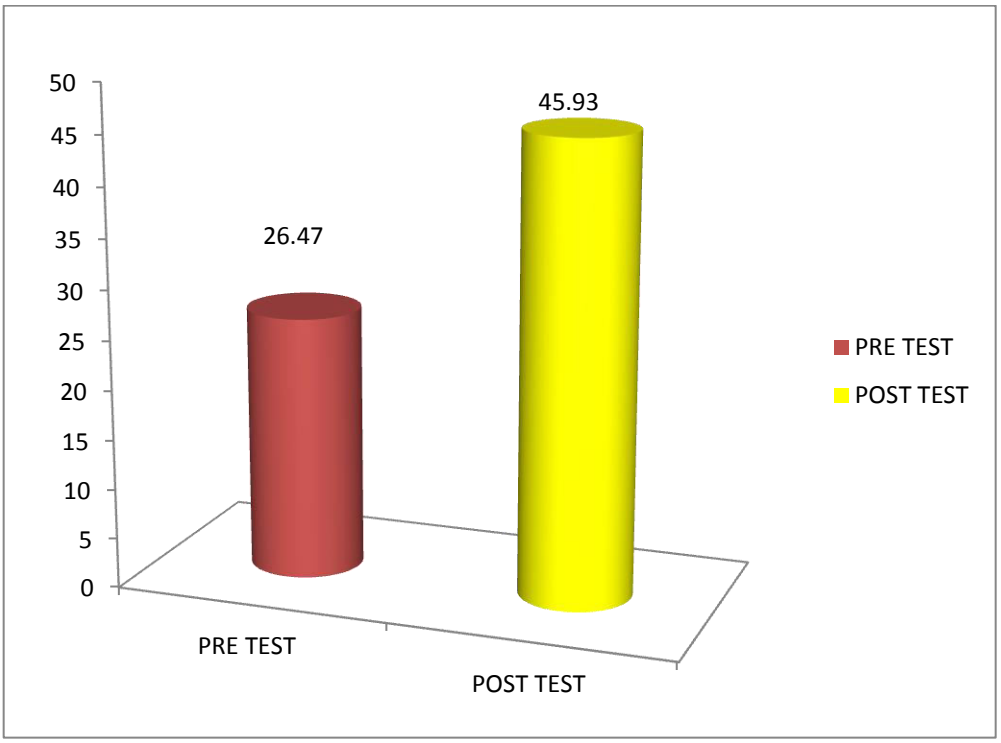


TABLE-V

PAIRED 't' TEST- BERG BALANCE SCALE

PRETEST AND POST TEST VALUES OF GROUP B

S.NO	GROUP B	MEAN	STANDARD DEVIATION	MEAN DIFFERENCE	't' VALUE
1.	PRE TEST	26.27	±1.16	15.66	38.194
2.	POST TEST	41.93	±1.53		

Using paired 't' test with 14 degrees of freedom and 0.05% as a level of significance, the table 't' value is 2.145 which was lesser than the calculated 't' value 38.194. The result shows that there was marked difference between pre-test and post-test values

GRAPH-V

PAIRED ‘t’ TEST- BERG BALANCE SCALE

GRAPHICAL REPRESENTATION OF PRETEST AND POST TEST VALUES OF GROUP B

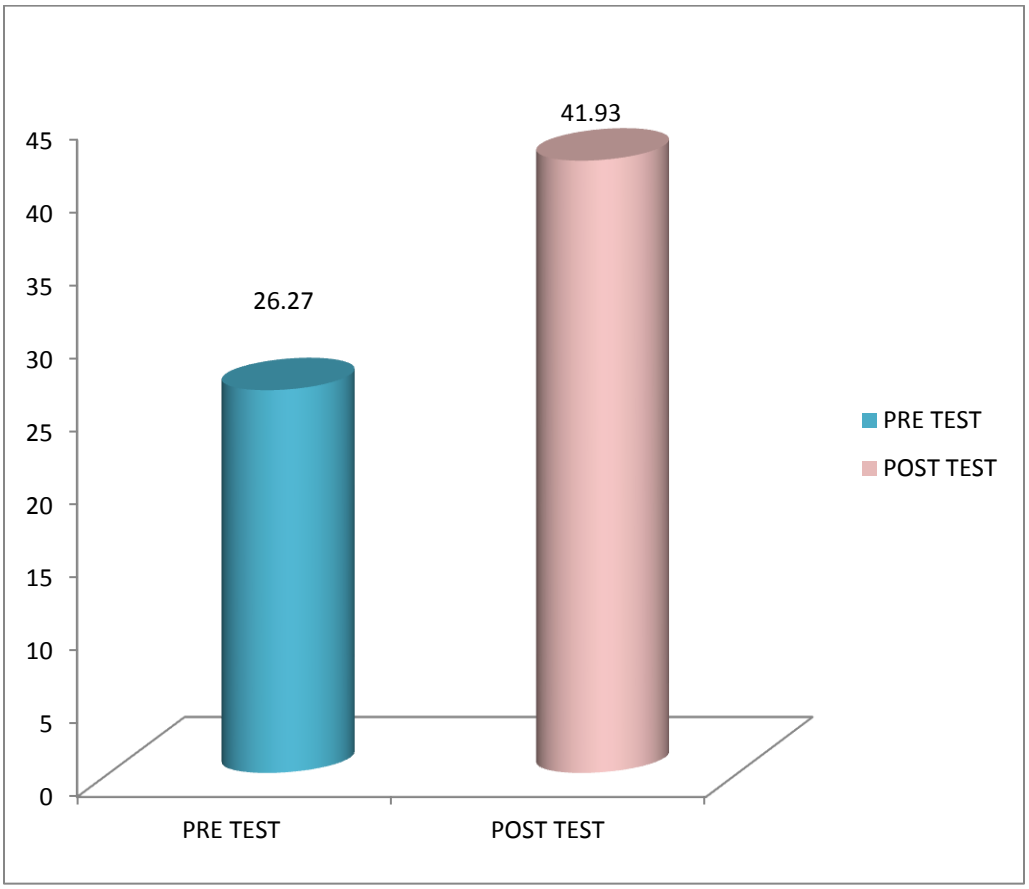


TABLE VI

UNPAIRED 't' TEST BERG BALANCE SCALE

POST TEST VALUES OF GROUP A AND GROUP B

S.NO	GROUPS	MEAN	STANDARD DEVIATION	MEAN DIFFERENCE	't' VALUE
1.	GROUP A	45.93	±1.58	4.00	7.036
2.	GROUP B	41.93	±1.53		

Using unpaired 't' test with 28 degrees of freedom at 0.05 % level of significance, the calculated post test 't' value of group A and group B was 7.036 which is greater than the critical value 2.048 which states that there is significant difference between the post test values of group A and group B.

GRAPH VI

UNPAIRED ‘t’ TEST -BERG BALANCE SCALE

GRAPHICAL REPRESENTATION OF

POST TEST VALUES OF GROUP A AND GROUP B

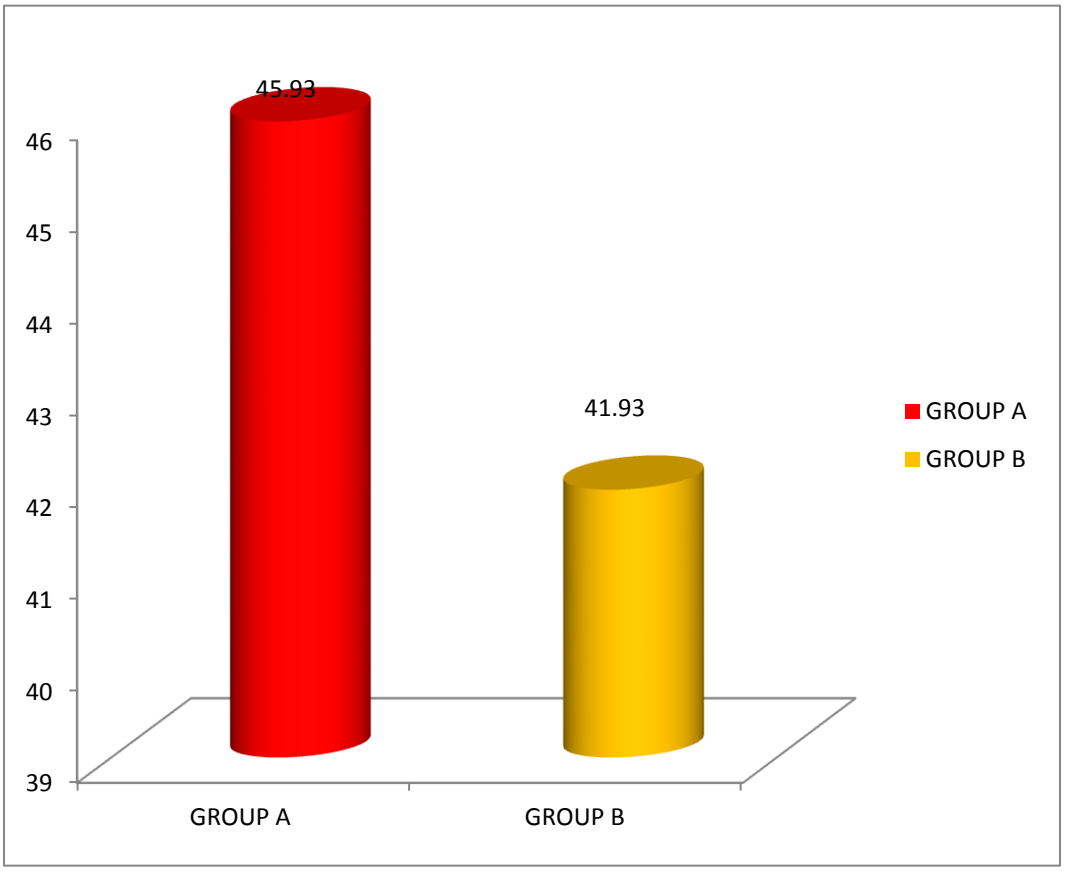


TABLE VII

PAIRED 't' TEST- TIMED UP & GO TEST

PRETEST AND POST TEST VALUES OF GROUP A

S.NO	GROUP A	MEAN	STANDARD DEVIATION	MEAN DIFFERENCE	't' VALUE
1.	PRE TEST	32.27	±2.02	10.47	36.018
2.	POST TEST	21.80	±1.61		

Using paired 't' test with 14 degrees of freedom at 0.05 % level of significance, the calculated post-test 't' value between control and experimental group was 36.018 and the critical value was 2.145 which states that there is significant improvement between the pre and post test values of group A.

GRAPH-VII

PAIRED ‘t’ TEST- TIMED UP & GO TEST

GRAPHICAL REPRESENTATION OF PRETEST AND POST TEST VALUES OF GROUP A

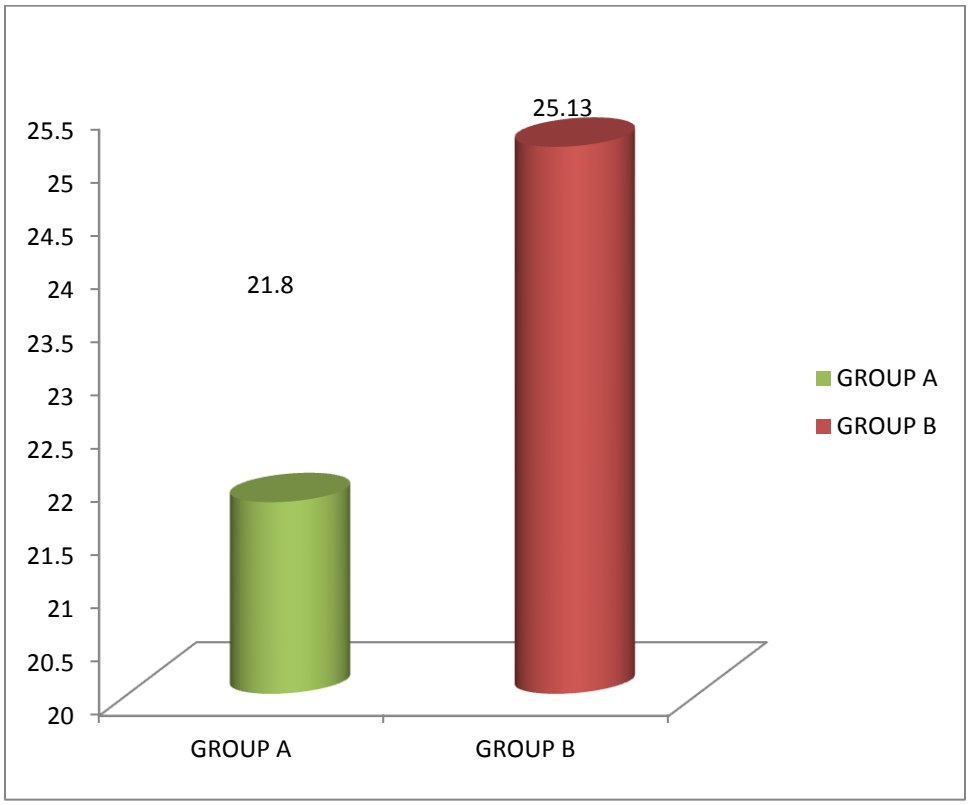


TABLE XIII

PAIRED ‘t’ TEST- TIMED UP & GO TEST

PRETEST AND POST TEST VALUES OF GROUP B

S.NO	GROUP B	MEAN	STANDARD DEVIATION	MEAN DIFFERENCE	‘t’ VALUE
1.	PRE TEST	33.07	±2.19	7.94	14.976
2.	POST TEST	25.13	±1.77		

Using paired ‘t’ test with 14 degrees of freedom at 0.05 % level of significance, the calculated post-test ‘t’ value between control and experimental group was 14.976 and the critical value was 2.145 which states that there is significant improvement between the pre and post test values of group B.

GRAPH-VIII

PAIRED 't' TEST- TIMED UP & GO TEST

GRAPHICAL REPRESENTATION OF PRETEST AND POST TEST VALUES OF GROUP B

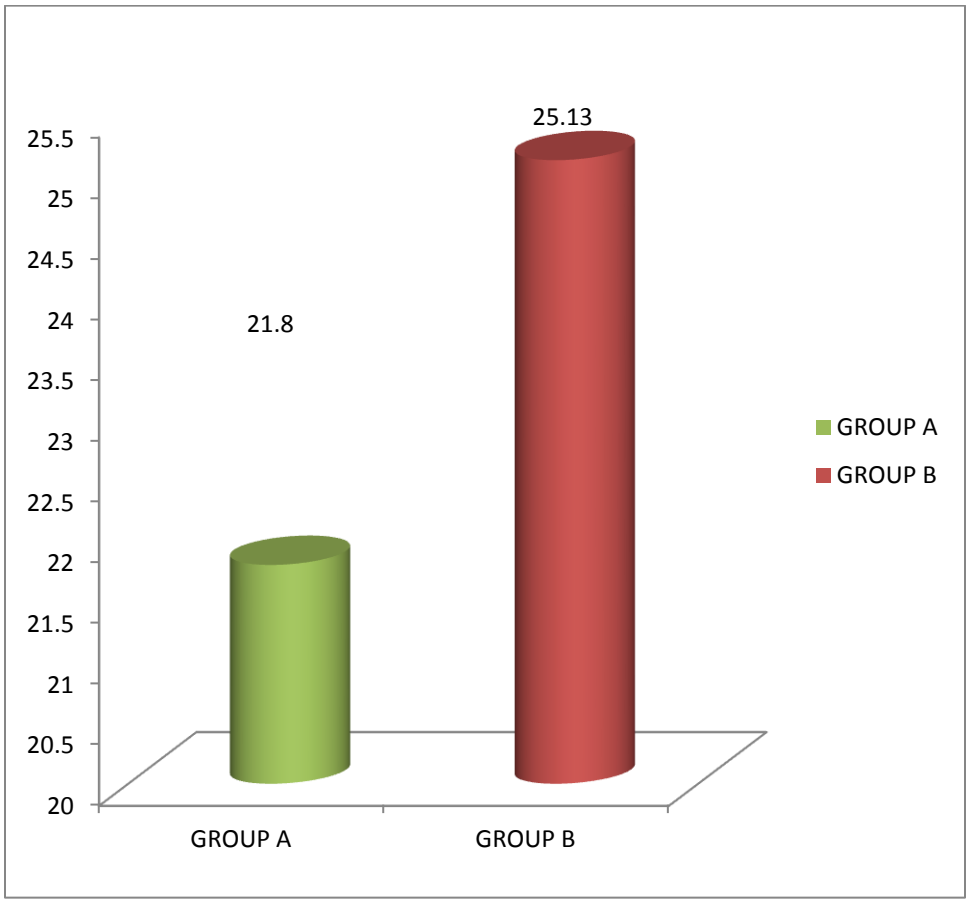


TABLE IX

UNPAIRED ‘t’ TEST-TIMED UP AND GO TEST

POST TEST VALUES OF GROUP A AND GROUP B

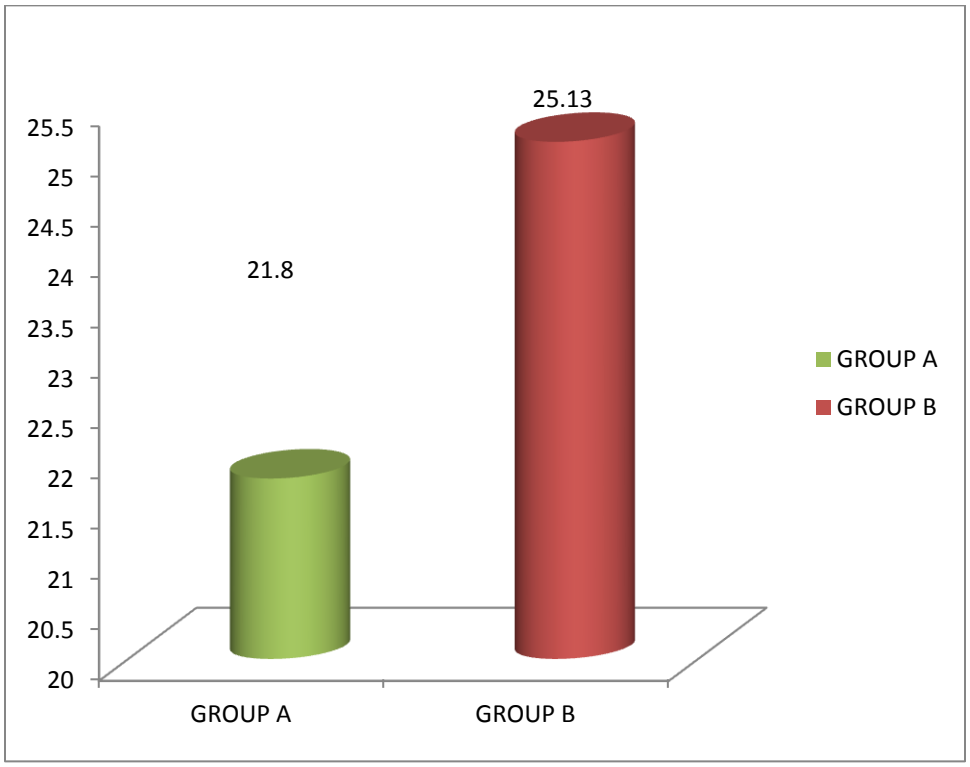
S.NO	GROUPS	MEAN	STANDARD DEVIATION	MEAN DIFFERENCE	‘t’ VALUE
1.	GROUP A	21.80	±1.61	3.33	5.3961
2.	GROUP B	25.13	±1.77		

Using unpaired ‘t’ test with 28 degrees of freedom at 0.05 % level of significance, the calculated post test ‘t’ value of group A and group B was 5.3961 which is greater than the critical value 2.048 which states that there is significant difference between the post test values of group A and group B

GRAPH- IX

UNPAIRED ‘t’ TEST-TIMED UP AND GO TEST

GRAPHICAL REPRESENTATION OF POST TEST VALUES OF GROUP A AND GROUP B



DISCUSSION

The trunk muscles play an important role in supporting our bodies against antigravity postures like sitting and standing and also in the stabilization of proximal parts of our body when performing the voluntary movements of the limbs. In stroke patients, loss of selective trunk control is often associated with limitations in breathing, speech, balance, mobility, arm and hand functions, therefore trunk function is needed for successful rehabilitation of patients with stroke in order to perform their activities of daily living.

Generally there is a limited accessibility to direct clinical examination of the trunk musculature and also the fact that trunk muscles are represented bilaterally and contralateral pathways are stronger. Hence trunk muscles has to be assessed as a separate entity to know the exact status of the patients functional abilities. Since more and more studies focus on upper extremity and lower extremity rehabilitation and trunk receives less attention, this study was carried out to analyse effectiveness of trunk rehabilitation versus task oriented training to improve trunk control ability, balance and functional mobility in post stroke patients.

The outcome measures used to assess trunk control, balance and functional mobility were Trunk impairment scale (TIS), Berg balance scale

(BBS), and Timed up and go test (TUGT) respectively. Statistical analysis using student 't' test revealed that both the groups showed improvement

But the percentage increase of TIS, BBS and TUGT in experimental group were 17.65%, 34.75% and 52.35% where compared to control group which had only 7.08%, 27.60% and 16.65%. this shows the superiority of task oriented training to improve trunk control, balance and functional mobility in stroke patients.

Task oriented training is patient and task oriented and is not therapist-focused. It is a more intensive program directed to trunk muscles which includes cortical reorganization. Practice of goal directed movements in day to day environment limits the compensatory movements and increase the adaptive movements. In this study several items for balance and lower extremity strength were done by changing the position in the frontal, sagittal and horizontal planes, which affects the equilibrium and weight shifting of the stroke patients which assisted in the outcome measures in the experimental group than in the control group.

SUMMARY AND CONCLUSION

The aim of the study was to compare the effect of task oriented training versus trunk rehabilitation exercises on trunk control ability, balance and functional mobility in stroke patients. 30 subjects who fulfilled the predetermined inclusive and exclusive criteria were selected and divided into two groups, 15 in each group. Group A underwent trunk rehabilitation exercises and group B underwent task oriented training. Trunk function was assessed by Trunk impairment scale, balance was assessed by Berg balance scale and functional mobility was assessed by Timed up and go test. Treatment duration was 12 weeks the value of outcome measures was recorded before the beginning of treatment regime day 1 and at the end of the of treatment regime end of 12^{th} week.

Statistical analysis was done using Student 't' test, paired t test was used to find out the improvement within the group. Unpaired 't' test was used to find out the difference between the groups. The results showed that task oriented training is more effective than trunk rehabilitation exercises on trunk control ability, balance and functional mobility in patients with stroke.

This study concluded that task oriented training is more effective than trunk rehabilitation exercises on trunk control ability, balance and functional mobility in patients with stroke.

LIMITATIONS AND RECOMMENDATIONS

Limitations

- The period allotted for the study was found to be insufficient for the inclusion of greater number of subjects.
- Influence of drug, nutritional, psychological state and climate cannot be controlled.
- Though Berg Balance scale (BBS),Trunk impairment scale (TIS), Timed up and go test were administered, bias is possible.
- The difference in individual interest shown towards to the treatment sessions and further practice.
- Small study with 15 subjects in each group were only included in the study.

RECOMMENDATIONS

- Study with more patients is recommended.
- Study can be done in subjects with different age groups.
- Follow up study can be done to know the long term effects.

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APPENDIX

APPENDIX-I

NEUROLOGICAL EVALUATION CHART

SUBJECTIVE ASSESSMENT

Name :

Age

Sex

Occupation

Handedness

Date of assessment

Date of admission

Chief Complaints

Present medical history

Past medical history

Personal history

Occupational history

Family history

Socioeconomic status

Environmental history

Risk factors

Associated problems

Pain history

- Side
- Site
- Onset
- Duration
- Quality
- Intensity
- Aggravating factors
- Relieving factors

Vital signs

- Temperature

- Pulse rate
- Respiratory rate
- BP

OBJECTIVE ASSESSMENT

ON OBSERVATION

- Built
- Posture
- Attitude of limbs
- Muscle wasting
- Edema
- Involuntary movements
- Tropical changes
- Deformities
- Gait
- Pressure sores
- Respiration
- External appliances

ON PALPATION:

- Edema
- Tenderness
- Warmth

ON EXAMINATION:

Higher mental function

- Consciousness
- Orientation
- Attention
- Memory
- Communication
- Emotional status

Higher cortical function

Cognition

Perception

Mental Status Assessment

- Affect
- Mood

- Behavior
- Speech
- Thought process
- Thought content

Speech

- Sound production
- Articulation
- Understanding & Experiencing

Hearing

Vision

Cranial nerve examination

Sensory system

- Superficial sensation
- Deep sensation
- Cortical sensation

Motor system

- Muscle tone

- Muscle girth
- Functional range of motion

Reflexes

- Superficial reflexes
- Deep reflexes
- Pathological reflexes

Voluntary movements

Involuntary movements

- Type
- Aggravating factors
- Limiting factors
- Quality

Balance

- Static balance
- Dynamic balance
- Balance reactions

Posture

- Lying
- Sitting
- Standing
- Gait

Hand functions

Other systems

Musculoskeletal system

- Fracture
- Muscle contracture
- Joint stiffness
- Joint subluxation
- Osteoporosis
- Limb length discrepancy

- **Integumentary system**
- **Autonomic nervous system**
- **Bladder function**
- **Bowel function**
- **Functional assessment**

ADL

Functional status

DIAGNOSIS

Problem list

Short term & Long term goals

Means

APPENDIX- II

Orpington Prognostic Score

The Orpington Prognostic Score (OPS), also known as Orpington Prognostic Scale, was developed from the Edinburgh Prognostic Score (Prescott, Garraway, & Akhtar, 1982) and the Hodkinson's Mental Test Score (Qureshi & Hodkinson, 1974) as a means to evaluate stroke severity. The OPS enables clinicians and researchers to stratify clients into a good, intermediate or poor prognosis group by using established cut-offs. The OPS is also very effective in predicting functional outcomes (Kalra&Crome, 1993).

Orpington Prognostic Score

Motor deficit in arm	**Score**
MRC Grade 5	0
MRC Grade 4	0.4
MRC Grade 3	0.8
MRC Grade 2	1.2
MRC Grade 1	1.6
Proprioception (eyes closed) - Locates affected thumb	**Score**
Accurately	0

Slight difficulty	0.4
Finds thumb via arm	0.8
Unable to find thumb	1.2
Balance	**Score**
Walks 10 feet without help	0
Maintains standing position	0.4
Maintains sitting position	0.8
No sitting balance	1.2
Cognition (Hodkinson's Mental Test)	**Score**
Mental Test Score 10	0
Mental Test Score 8-9	0.4
Mental Test Score 5-7	0.8
Mental Test Score 0-4	1.2

TOTAL SCORE = 1.6 + motor + proprioception + balance + cognition ____

APPENDIX III

THE TIMED UP AND GO TEST

Timed Up and Go (TUG) Test

Name:_____ MR: _____

Date:_____

1. **Equipment**: arm chair, tape measure, tape, stop watch.

2. Begin the test with the subject sitting correctly (hips all of the way to the back of the seat) in a chair with arm rests. The chair should be stable and positioned such that it will not move when the subject moves from sit to stand. The subject is allowed to use the arm rests during the sit – stand and stand – sit movements.

3. Place a piece of tape or other marker on the floor 3 meters away from the chair so that it is easily seen by the subject

4. **Instructions**: "On the word GO you will stand up, walk to the line on the floor, turn around and walk back to the chair and sit down. Walk at your regular pace.

5. Start timing on the word "GO" and stop timing when the subject is seated again correctly in the chair with their back resting on the back of the chair.

6. The subject wears their regular footwear, may use any gait aid that they normally use during ambulation, but may not be assisted by another person. There is no time limit. They may stop and rest (but not sit down) if they need to.

7. Normal healthy elderly usually complete the task in ten seconds or less. Very frail or weak elderly with poor mobility may take 2 minutes or more.

8. The subject should be given a practice trial that is not timed before testing.

9. Results correlate with gait speed, balance, functional level, the ability to go out, and can follow change over time. Normative Reference Values by Age 1 Age Group Time in Seconds (95% Confidence Interval) 60 – 69 years 8.1 (7.1 – 9.0) 70 – 79 years 9.2 (8.2 – 10.2) 80 – 99 years 11.3 (10.0 – 12.7) Cut-off

Values Predictive of Falls by Group Time in Seconds Community Dwelling Frail Older Adults 2 > 14 associated with high fall risk Post-op hip fracture patients at time of discharge3 > 24 predictive of falls within 6 months after hip fracture Frail older adults > 30 predictive of requiring assistive device for ambulation and being dependent in ADLs Date Time References 1. Bohannon RW.

APPENDIX IV

TRUNK IMPAIRMENT SCALE

Starting position for all items: sitting, thighs horizontal and feet flat on support, knees 90° flexed, no back support, hands and forearms resting on the thighs. The subject gets 3 attempts for each item. The best performance is scored. The observer may give feedback between the tests. Instructions can be verbal and nonverbal (demonstration).

Item	Task Description	Score Description	Score	Remarks
	Static Sitting Balance			
1.	Keep starting position for 10 s	Falls or needs arm support Maintains position for 10 s	0 2	If 0, total TIS score is 0
2.	Therapist crosses strongest leg over weakest leg, keep position for 10 s	Falls or needs arm support Maintains position for 10 s	0 2	
3.	Patient crosses strongest leg over weakest leg	Falls Needs arm support Displaces trunk 10 cm or assists with arm Moves without trunk or arm compensation	0 1 2 3	
			/7	
	Dynamic Sitting Balance			
1.	Touch seat with right elbow, return to starting position (task achieved or not)	Does not reach seat, falls, or uses arm Touches seat without help	0 1	If 0, items 2 3 are also 0
2.	Repeat item 1 (evaluate trunk movement)	No appropriate trunk movement Appropriate trunk movement (shortening right side, lengthening left side)	0 1	If 0, item 3 is also 0
3.	Repeat item 1 (compensation strategies used or not)	Compensation used (arm, hip, knee, foot) No compensation strategy used	0 1	
4.	Touch seat with left elbow, return to starting position (task achieved or not)	Does not reach seat, falls, or uses arm Touches seat without help	0 1	If 0, items 5 6 are also 0
5.	Repeat item 4 (evaluate trunk movement)	No appropriate trunk movement Appropriate trunk movement (shortening left side, lengthening right side)	0 1	If 0, item 6 is also 0
6.	Repeat item 4 (compensation strategies used or not)	Compensation used (arm, hip, knee, foot) No compensatory strategy used	0 1	
7	Lift right side of pelvis from seat, return to starting position (evaluate trunk movement)	No appropriate trunk movement Appropriate trunk movement (shortening right side, lengthening left side)	0 1	If 0, item 8 is also 0
8.	Repeat item 7 (compensation strategies used or not)	Compensation used (arm, hip, knee, foot) No compensation strategy used	0 1	
9.	Lift left side of pelvis from seat, return to starting position (evaluate trunk movement)	No appropriate trunk movement Appropriate trunk movement (shortening left side, lengthening right side)	0 1	If 0, item 10 is also 0
10.	Repeat item 9 (compensation strategies used or not)	Compensation used (arm, hip, knee, foot) No compensation strategy used	0 1	
			/10	
	Coordination			

1.	Rotate shoulder girdle 6 times (move each shoulder 3 times forward)	Does not move right side 3 times Asymmetric rotation Symmetric rotation	0 1 2	If 0, item 2 of also 0
2.	Repeat item 1, perform within 6 s	Asymmetric rotation Symmetric rotation	0 1	
3.	Rotate pelvis girdle 6 times (move each knee 3 times forward)	Does not move right side 3 times Asymmetric rotation Symmetric rotation	0 1 2	If 0, item 4 is also 0
4.	Repeat item 3, perform within 6 s	Asymmetric rotation Symmetric rotation	0 1	
			/6	
		Total Trunk Impairment Scale	/23	

APPENDIX-V

BERG BALANCE SCALE

The Berg Balance Scale (BBS) was developed to measure balance among older people with impairment in balance function by assessing the performance of functional tasks. It is a valid instrument used for evaluation of the effectiveness of interventions and for quantitative descriptions of function in clinical practice and research. The BBS has been evaluated in several reliability studies. A recent study of the BBS, which was completed in Finland, indicates that a change of eight (8) BBS points is required to reveal a genuine change in function between two assessments among older people who are dependent in ADL and living in residential care facilities.

Description:

14-item scale designed to measure balance of the older adult in a clinical setting. **Equipment needed:**

Ruler, two standard chairs (one with arm rests, one without), footstool or step, stopwatch or wristwatch, 15 ft walkway

Completion:

Time: 15-20 minutes

Scoring: A five-point scale, ranging from 0-4. “0” indicates the lowest level of function and “4” the highest level of function. Total Score = 56

Interpretation: 41-56 = low fall risk

21-40 = medium fall risk

0 –20 = high fall risk

A change of 8 points is required to reveal a genuine change in function between 2 assessments.

Berg Balance Scale

Name: _____ Date: _____

Location: _____ Rater: _____

ITEM DESCRIPTION SCORE (0-4)

Sitting to standing _____

Standing unsupported _____

Sitting unsupported _____

Standing to sitting _____

Transfers _____

Standing with eyes closed _____

Standing with feet together _____

Reaching forward with outstretched arm _____

Retrieving object from floor _____

Turning to look behind _____

Turning 360 degrees _____

Placing alternate foot on stool _____

Standing with one foot in front _____

Standing on one foot _____ Total _____

GENERAL INSTRUCTIONS:

Document each task and/or give instructions as written. When scoring, please record the lowest response category that applies for each item. In most items, the subject is asked to maintain a given position for a specific time. Progressively more points are deducted if:

• The time or distance requirements are not met

• The subject's performance warrants supervision

• The subject touches an external support or receives assistance from the examiner.

Subject should understand that they must maintain their balance while attempting the tasks. The choices of which leg to stand on or how far to reach are left to the subject. Poor judgment will adversely influence the performance and the scoring. Equipment required for testing is a stopwatch or watch with a second hand, and a ruler or other indicator of 2, 5, and 10 inches.

Chairs used during testing should be a reasonable height. Either a step or a stool of average step height may be used for item # 12.

Berg Balance Scale

SITTING TO STANDING : Please stand up. Try not to use your hand for support.

- 4-able to stand without using hands and stabilize independently
- 3-able to stand independently using hands
- 2- able to stand using hands after several tries
- 1- needs minimal aid to stand or stabilize
- 0- needs moderate or maximal assist to stand

STANDING UNSUPPORTED: Please stand for two minutes without holding on.

- 4- able to stand safely for 2 minutes
- 3 -able to stand 2 minutes with supervision
- 2 -able to stand 30 seconds unsupported
- 1 -needs several tries to stand 30 seconds unsupported
- 0- unable to stand 30 seconds unsupported If a subject is able to stand 2 minutes unsupported, score full points for sitting unsupported. Proceed to item #4.

SITTING WITH BACK UNSUPPORTED BUT FEET SUPPORTED ON FLOOR OR ON A STOOL: Please sit with arms folded for 2 minutes.

- 4- able to sit safely and securely for 2 minutes
- 3 -able to sit 2 minutes under supervision
- 2 -able to able to sit 30 seconds
- 1 -able to sit 10 seconds
- 0 -unable to sit without support 10 seconds

STANDING TO SITTING : Please sit down.

- 4- sits safely with minimal use of hands
- 3 - controls descent by using hands
- 2 - uses back of legs against chair to control descent
- 1 - sits independently but has uncontrolled descent
- 0 - needs assist to sit

TRANSFERS INSTRUCTIONS: Arrange chair(s) for pivot transfer. Ask subject to transfer one way toward a seat with armrests and one way toward a seat without armrests. You may use two chairs (one with and one without armrests) or a bed and a chair.

- 4- able to transfer safely with minor use of hands
- 3- able to transfer safely definite need of hands
- 2- able to transfer with verbal cuing and/or supervision
- 1- needs one person to assist
- 0- needs two people to assist or supervise to be safe

STANDING UNSUPPORTED WITH EYES CLOSED INSTRUCTIONS:

Please close your eyes and stand still for 10 seconds.

- 4- able to stand 10 seconds safely
- 3- able to stand 10 seconds with supervision
- 2- able to stand 3 seconds
- 1- unable to keep eyes closed 3 seconds but stays safely
- 0- needs help to keep from falling

STANDING UNSUPPORTED WITH FEET TOGETHER INSTRUCTIONS: Place your feet together and stand without holding on

- 4- able to place feet together independently and stand 1 minute safely
- 3- able to place feet together independently and stand 1 minute with supervision
- 2- able to place feet together independently but unable to hold for 30 seconds
- 1- needs help to attain position but able to stand 15 seconds feet together
- 0- needs help to attain position and unable to hold for 15 seconds

REACHING FORWARD WITH OUTSTRETCHED ARM WHILE STANDING INSTRUCTIONS:

Lift arm to 90 degrees. Stretch out your fingers and reach forward as far as you can. (Examiner places a ruler at the end of fingertips when arm is at 90 degrees. Fingers should not

touch the ruler while reaching forward. The recorded measure is the distance forward that the fingers reach while the subject is in the most forward lean position. When possible, ask subject to use both arms when reaching to avoid rotation of the trunk.)

- 4 - can reach forward confidently 25 cm (10 inches)
- 3- can reach forward 12 cm (5 inches)
- 2- can reach forward 5 cm (2 inches)
- 1- reaches forward but needs supervision
- 0- loses balance while trying/requires external support

PICK UP OBJECT FROM THE FLOOR FROM A STANDING POSITION INSTRUCTIONS: Pick up the shoe/slipper, which is in front of your feet.

- 4- able to pick up slipper safely and easily
- 3- able to pick up slipper but needs supervision
- 2- unable to pick up but reaches 2-5 cm(1-2 inches) from slipper and keeps balance independently
- 1- unable to pick up and needs supervision while trying
- 0- unable to try/needs assist to keep from losing balance or falling

TURNING TO LOOK BEHIND OVER LEFT AND RIGHT SHOULDERS WHILE STANDING INSTRUCTIONS: Turn to look directly behind you over toward the left shoulder.

Repeat to the right. (Examiner may pick an object to look at directly behind the subject to encourage a better twist turn.)

- 4- looks behind from both sides and weight shifts well
- 3 -looks behind one side only other side shows less weight shift
- 2 -turns sideways only but maintains balance
- 1 -needs supervision when turning
- 0 -needs assist to keep from losing balance or falling

TURN 360 DEGREES INSTRUCTIONS: Turn completely around in a full circle. Pause. Then turn a full circle in the other direction.

- 4- able to turn 360 degrees safely in 4 seconds or less
- 3 - able to turn 360 degrees safely one side only 4 seconds or less
- 2- able to turn 360 degrees safely but slowly
- 1- needs close supervision or verbal cuing
- 0- needs assistance while turning

PLACE ALTERNATE FOOT ON STEP OR STOOL WHILE STANDING UNSUPPORTED INSTRUCTIONS: Place each foot alternately on the step/stool. Continue until each foot has touched the step/stool four times.

- 4- able to stand independently and safely and complete 8 steps in 20 seconds
- 3 -able to stand independently and complete 8 steps in > 20 seconds

- 2- able to complete 4 steps without aid with supervision
- 1 -able to complete > 2 steps needs minimal assist
- 0- needs assistance to keep from falling /unable to try

STANDING UNSUPPORTED ONE FOOT IN FRONT INSTRUCTIONS: (DEMONSTRATE TO SUBJECT) Place one foot directly in front of the other. If you feel that you cannot place your foot directly in front, try to step far enough ahead that the heel of your forward foot is ahead of the toes of the other foot.

- 4- able to place foot tandem independently and hold 30 seconds
- 3- able to place foot ahead independently and hold 30 seconds
- 2- able to take small step independently and hold 30 seconds
- 1- needs help to step but can hold 15 seconds
- 0- loses balance while stepping or standing

STANDING ON ONE LEG INSTRUCTIONS: Stand on one leg as long as you can without holding on.

- 4- able to lift leg independently and hold > 10 seconds
- 3- able to lift leg independently and hold 5-10 seconds
- 2- able to lift leg independently and hold ≥ 3 seconds
- 1-tries to lift leg unable to hold 3 seconds but remains standing independently.
- 0- unable to try of needs assist to prevent fall

TOTAL SCORE (Maximum = 56)

APPENDIX VI

TRUNK REHABILITATION EXERCISES

Pelvic bridging

Single leg pelvic bridging

Bridging with arms above the head

Knee rolling

Four point kneeling

Superman pose

APPENDIX VI

TASK ORIENTED TRAINING

Step ups

Kicking a ball

Stairs

Back ward walk

Walk and carry

Treadmill

Balance beams

APPENDIX-VII

CONSENT FORM

This is to certify that I ---------- freely and voluntarily agree to participate in the study **"EFFECT OF TRUNK REHABILITATION EXERCISES VERSUS TASK ORIENTED TRAINING ON TRUNK CONTROL ABILITY, BALANCE AND FUNCTIONAL MOBILITY IN PATIENTS WITH STROKE''**

I have explained about the procedure and the risks that would occur during the study.

Participant:

Witness:

Date:

I have explained and defined the procedure to which the subject has consented to participate.

Researcher:

Date: